NASA Project Management Development Process
Version 4.5

As implemented by:
Marshall Space Flight Center

June 2004

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Acknowledgements

We would like to thank all those who contributed their time and talent to this project. It is our hope that the Project Management community will find it useful in their pursuit of excellence.

This effort was shaped by the Marshall Space Flight Center (MSFC) organizational representatives that made up the Project Management Board Working Group who spent countless hours of review and discussion. The Academy of Program and Project Leadership personnel have also been very supportive.

In particular, we would like to thank Dr. James C. Blair, Dr. Luke A. Schutzenhofer, and Mr. Robert Ryan who, when they retired from MSFC, could not shake the call of space flight from their soul. Their insightful contribution, drawing from their years of work ranging from the Redstone Rocket to the *International Space Station*, made this effort possible. Jim, Bob, and Luke—the Three Amigos as they came to be called—provided a solid foundation from which to build.

We would also like to thank Dr. Paul Componation, Associate Professor of Industrial and Systems Engineering at the University of Alabama in Huntsville, for sharing his expertise in Project Management/System Engineering and his assistance in developing a user-friendly process for candidate development, evaluation, and certification.

Finally, Ms. Sharon Wiegmann of the Systems Management Office provided the insight and inspiration that led to this current Program and Project Management development and certification revision.

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Introduction

The Project Management Development Process (PMDP) helps employees, who are interested in developing as a Project Manager for flight hardware/software, plan their careers with the National Aeronautics and Space Administration (NASA). The PMDP describes the competencies expected for each of the four Program/Project Management Certification Levels, describes the training expectations, and provides a checklist that describes how to apply for the appropriate certification level.

There are four Program/Project Management Certification Levels:

1. Level I—Project Engineer/Team Member: Employees applying for Level I Certification will have obtained a working knowledge of Project Management concepts and tools. They will have contributed to project activities and performed tasks to support a project. The emphasis on Level I candidates is knowledge and understanding of Project Management.

2. Level II—Subsystem or Small Project Manager (PM): Employees applying for Level II Certification will have performed PM activities, leading efforts on a subsystem or small project. They will have participated in activities such as requirements development, budget and schedule development, and risk management. The emphasis on Level II candidates is leadership application and participation in Project Management.

3. Level III—Major System or PM: Employees applying for Level III Certification will have taken a significant leadership role in Project Management. They will have experience in multiple phases of a project life cycle managing both programmatic and technical aspects. The emphasis on Level III candidates is the directing, structuring, and integration activities of Project Management.

4. Level IV—Program Manager (PGM) or Manager of a Large Project: Employees applying for Level IV Certification will have demonstrated superior competencies in all formulation and implementation Project Management activities. They will have contributed to Agency goals and be effective in managing programmatic, technical, and strategic interfaces both internal and external to the Agency. The emphasis on Level IV candidates is the strategy and management of Agency initiatives.

The PMDP Certification process places an emphasis on work experience supported by appropriate training and education. Successful candidates have found that a breadth of technical and managerial experiences, supplemented with appropriate rotational assignments, provides a solid basis for addressing the required competencies. Candidates are evaluated on their application package, training and Individual Development Plans, and work history.

Descriptions of required PMDP courses are included in this document. Candidates are expected to have completed all required courses for their requested level of certification as well as courses for lower levels. A candidate may request a waiver of a course if they have evidence they have mastered course objectives by alternative training, work experience, or both. The candidate may submit a waiver justification of no more than 2 pages for consideration by the Project Management Board (PMB).

The PMDP includes a complete listing of the competency expectations for each level and a list of training expectations. A checklist is also included that describes the steps in the certification process. Employees interested in applying for Program/Project Management Certification should contact the PMDP Coordinator in the Employee and Organization Development Department (EODD) and consult the EODD Web site at http://mi.msfc.nasa.gov/pmdp/index.shtml for information and application templates. The PMDP Coordinator will be able to answer questions regarding the PMDP and also provide application templates.

Certification Checklist for Project Management Development Process V4.5

Activity	Candidate	PMDP Coordinator	Project Management Board
1.0 Prepare The Application for Certification in Project Management Development			
1.1 Contacting the Project Management Development Process Coordinator The PMDP Coordinator can provide you with current information on PMDP and guide you in selecting the appropriate certification level.	✓		
1.2 Completion of the Application The application template for each level can be downloaded and completed electronically from: http://mi/msfc.nasa.gov/pmdp/index.shtml. Follow the checklist provided in part 1 of the application.	✓		
1.3 Application Submittal You will need to submit a hardcopy and electronic copy of the application to the PMDP Coordinator.	✓		
2.0 Project Management Development Process Coordinator			
2.1 Application Review The PMDP Coordinator in EODD will review the application.		✓	
2.2 Project Management Board Agenda The application will be added to the agenda for a PMB Meeting; Levels II, III and IV candidates will be contacted to schedule their oral briefing to the PMB.		✓	
2.3 Distribute Application An agenda and all applications are distributed to the PMB members no later than 3 days before the meeting.		✓	
3.0 Project Management Board			
3.1 Application Review PMB members will have the opportunity to review applications prior to the PMB meeting.			✓
3.2 Project Management Board Certification Meeting At the meeting, the PMB will review the application, the accomplishments briefing, and the collective knowledge of the candidate. The PMB may award the requested level of certification, a lower level of certification, or may decline to award certification			✓
3.3 Notification Candidates will be contacted after the PMB Meeting. NASA Headquarters (HQ) will award candidate certifications.			✓

General Project Management Development Process Level Descriptions/Definitions

(Note: Each Directorate/Office will classify the level of each of the programs, projects, and activities (PPA) within their organization. Key project personnel must be certified to the designated level of the PPA that they are supporting. For certification application templates, please refer to the EODD Web page, http://mi.msfc.nasa.gov/pmdp/index.shtml.)

(Note: Level I knowledge and understanding may be obtained via formal training courses, self-study, applicable work experience, etc. The application and adaptation of the knowledge required for Levels II, III, and IV can only be validated by successful accomplishments in support of a program or project.)

	Level			
	I	**II**	**III**	**IV**
Levels of Project Leadership	Project Engineer/Team Member	Subsystem or Small Project Manager	Major System or Large Project Manager	Program or Very Large and Complex Project Manager
Description:	Performs fundamental, basic, and routine activities, while gaining subject matter expertise in requirements definition, using a Work Breakdown Structure (WBS) in project planning, estimating project risk, cost/schedule work elements, budgeting concepts, scheduling concepts, configuration management, and baseline control. Contributes to project activities, such as annual Program/Project Operating Plan (POP) inputs, reviews, and specific contributions as specified in a project WBS, and the schedule/cost reporting process. Obtains a working knowledge of Project Management concepts, processes, and tools.	Performs management of a simple project (e.g., no more than one or two simple internal/external interfaces, smaller team, simpler contracting processes, smaller budget, shorter duration, etc.). Contributes to a larger system effort by assisting in project requirements definition, planning and budgeting, WBS development and use, project schedule development and use, risk planning, establishment of project cost/ schedule/ technical baselines, selection and use of appropriate reports, application of configuration management, hardware/ software integration, testing and evaluation, contract management process and review, and team facilitative leadership.	Performs management of a more complex project (possibly three distinct subsystems/ parts/pieces, or other defined services, capabilities, or products) with associated interfaces. Contributed to a larger project or program by taking leadership responsibility and management in the initiation and/or development of content/skill areas specified in the PMDP model, and demonstrates successful top-level management of subordinate elements that are developing in parallel	Performs management of a complex program or a set of complex projects with multiple associated interfaces. Sets the organizational climate for the overall effort and effectively adapts to political and strategic realities so that the overall effort remains viable (boundary scanning).
Key Words:	knowledge, understanding	application, participant	direct, structuring, integrating	manage, strategy
Required Courses:	Foundations of Project Management (FPM)	Project Management, Systems Management (SM), Contracting Officers Technical Representative (COTR)	Advanced Project Management (APM)	Program Management, International Project Management (IPM)

Competency Worksheet Requirements

Competency Title	Level I	Level II	Level III	Level IV
1.0 Program/Project Conceptualization and Planning				
1.1 Project Concept Definition	Awareness of developing functional, physical, and operational architectures, including life cycle costing. Understanding of development, trading, and selecting concepts along with their technology plans.	Participated in developing functional, physical, and operational architectures, including life cycle costing. Participated in development, trading, and selecting concepts along with their technology plans.	Demonstrated capability in developing functional, physical, and operational architectures, including life cycle costing. Demonstrated capability in development, trading, and selecting concepts along with their technology plans.	Directed development of functional, physical, and operational architectures, including life cycle costing and trading concepts. Directed development, trading, and selecting concepts along with their technology plans.
1.2 Technical Integration	Understanding of technical integration of project elements, design functions and discipline functions, and their associated interactions to balance performance, cost, schedule, reliability, and operability.	Participated in technical integration of project elements, design functions and discipline functions, and their associated interactions to balance performance, cost, schedule, reliability, and operability.	Demonstrated capability in technical integration of project elements, design functions and discipline functions, and their associated interactions to balance performance, cost, schedule, reliability, and operability.	Directed technical integration of project elements, design functions and discipline functions, and their associated interactions to balance performance, cost, schedule, reliability, and operability.
1.3 Requirements Development	Understanding of the process of development and iteration of requirements including stakeholder acceptance. Knowledge of requirements baselining process.	Contributed to development and iteration of requirements including stakeholder acceptance. Participated in requirements baselining process.	Led development and iteration of requirements for subsystem or small project including stakeholder acceptance. Demonstrated capability in requirements baselining process.	Managed development and iteration of requirements for project or large subsystem including stakeholder acceptance. Directed requireements baselining process.

Competency Title	Level I	Level II	Level III	Level IV
1.4 Project Planning	**A:** Knowledge of life cycle project planning including WBS, budget, schedule, staffing, and project success criteria.	**A:** Involved in development of a life cycle project plan including WBS, budget, schedule, staffing, and project success criteria.	**A:** Demonstrated capability in development of a life cycle project plan including WBS, budget, schedule, staffing, and project success criteria.	**A:** Directed development of a life cycle project plan including WBS, budget, schedule, staffing, and project success criteria.
	B: Knowledge of project formulation activities.	**B:** Participated in project formulation activities.	**B:** Managed a small project, subsystem, or equivalent entity during formulation phase. As manager, had sole authority for project budget, schedule, and scope.	**B:** Managed a large project, major system, or equivalent entity during formulation phase. As manager, had sole authority for program/project budget, schedule, and scope.
1.5 Acquisition Strategies, Procurement and Contracting	Awareness of development of contract Statements of Work (SOW), Data Requirement Descriptions (DRDs), verification plans, and approval requirements to support flight hardware/software.	Contributed to development, implementation and monitoring acquisition strategies, contract SOW, DRDs, verification plans, and approval requirements to support flight hardware/software.	Demonstrated capability in development, implementation and monitoring acquisition strategies, contract SOW, DRDs, verification plans, and approval requirements to support flight hardware/software.	Directed development, implementation and monitoring acquisition strategies, contract SOW, DRDs, verification plans, and approval requirements to support flight hardware/software.

Competency Title	Level I	Level II	Level III	Level IV
2.0 Continuous Risk Management				
2.1 Risk Management	Understanding of risk management process and utilization of risk analysis to support decisionmaking.	Participated in a risk management process and utilization of risk analysis to support decision-making.	Led a risk management process and utilization of risk analysis to support decisionmaking.	Directed a risk management process and utilization of risk analysis to support decision-making.
2.2 Technical Insight	Awareness of penetration/insight required for contractor activities.	Supported development of penetration/insight required for contractor activities and decisionmaking based upon risk assessment.	Demonstrated capability in developing penetration/insight required for contractor activities and decisionmaking based upon risk assessment.	Responsible for developing penetration/insight required for contractor activities and decisionmaking based upon risk assessment.

Competency Title	Level I	Level II	Level III	Level IV
3.0 Budget Management				
3.1 Project Budget	Understanding of the project budget development process.	Contributed to the project budget development process, and understood the budget relationship to the Program Operating Plan (POP).	Led budget development and iteration with the POP for a subsystem, small project, or equivalent entity.	Managed budget development and iteration with the POP for a large project.
3.2 NASA's Accounting and Financial System	Knowledge of NASA's accounting and financial systems.	Contributed to recording of project budget activities in NASA's accounting and financial systems.	Directed application of NASA's accounting and financial systems to project activities.	Managed and ensured accuracy of budget activities in NASA's accounting and financial systems for a large project.

Competency Title	Level I	Level II	Level III	Level IV
4.0 Project Implementation				
4.1 Systems Engineering/ Technical Integration	Knowledge of SP 6105 including requirements and verification management, configuration and data management, etc. Understanding of project/technical integration of project elements, design functions, discipline functions, and associated interactions to balance performance, cost, schedule, reliability, and operability.	Applied SP 6105 including requirements and verification management, configuration and data management, etc. Participated in project/technical integration of project elements, design functions, discipline functions, and associated interactions to balance performance, cost, schedule, reliability, and operability.	Leadership in structuring activity to conform to SP 6105 including requirements and verification management, configuration and data management, etc. Leadership in project/technical integration of project elements, design functions, discipline functions, and associated interactions to balance performance, cost, schedule, reliability, and operability.	Directed conformance activities related to SP 6105, including requirements and verification management, configuration and data management, etc. Management of the process of project/technical integration to balance performance, cost, schedule, reliability, and operability.
4.2 Design and Development	Understanding of the project implementation process including requirements management, design, manufacturing, assembly, verification, and acceptance.	Participated in the project implementation process, including requirements management, design, manufacturing, assembly, verification, and acceptance	Managed a small project, subsystem or equivalent entity during implementation phase, including requirements management, design, manufacturing, assembly, verification, and acceptance, with full authority for both programmatic and technical decisions.	Managed a major system or large project, or equivalent entity during implementation phase, including requirements management, design, manufacturing, assembly, verification, and acceptance, with full authority for both programmatic and technical decisions.
4.3 Operations	Knowledge of planning and execution of flight hardware/software training, ground operations, launch and mission operations, flight data, and retirement for a subsystem or small project.	Contributed to planning and execution of flight hardware/software training, ground operations, launch and mission operations, flight data, and retirement for a subsystem or small project.	Managed the planning and execution of flight hardware/ software training, ground operations, launch and mission operations, flight data, and retirement for a subsystem or small project. Responsible for decisions made during operations to ensure project/ mission success.	Managed the planning and execution of flight hardware/software training, ground operations, launch and mission operations, flight data, and retirement for a major system or large project. Responsible for decisions made during operations to ensure project/ mission success.

Competency Title	Level I	Level II	Level III	Level IV
4.4 Stakeholder Management	Awareness of stakeholder involvement and communication. Awareness of political, economic, and other factors that influence project goals. Awareness of external advocacy needs of project.	Contributed to developing and maintaining stakeholder communication and assessing both internal and external influences on the project.	Demonstrated capability for frequent involvement of stakeholders throughout the project life cycle, to ensure understanding of requirements, and assess both internal and external influences on the project.	Directed process of developing and maintaining stakeholder communication throughout the project life cycle. Experience with establishing domestic and/or international relationships considering impacts of political, economic, and other factors on project goals. Directed and implemented external advocacy for an initiative and outreach and education of stakeholders.

Competency Title	Level I	Level II	Level III	Level IV
5.0 Program/Project Management and Control				
5.1 Contract Management	Understanding of configuration or change control process. Understanding of contract performance, variance reporting, and contract award recommendation.	Experience with contract change control. Experience with contract performance, variance reporting, and contract award recommendation.	Demonstrated capability for project contract management including change control, monitoring of contract performance, variance reporting, and contract award recommendation.	Chaired contract change control board for Project. Management of contract performance evaluation and award recommendation.
5.2 Tracking/Trending of Project Performance	Understanding of project reporting and evaluation of technical performance metrics, earned value, and risk management analysis.	Contributed to project reporting and evaluation of technical performance metrics, earned value, and risk management analysis. Participated in project monitoring and formal reviews.	Leadership role in project reporting and evaluation of technical performance metrics, earned value, and risk management analysis. Conducted continual project monitoring and formal reviews.	Managed project reporting and evaluation of technical performance metrics, earned value, and risk management analysis. Conducted continual project monitoring and formal reviews.

Competency Title	Level I	Level II	Level III	Level IV
5.3 Project Control	**A:** Knowledge of process for using tracking and trend data to analyze programmatic and technical performance with associated mitigation efforts to address performance variances.	**A:** Experience in applying tracking and trend data to analyze programmatic and technical performance with associated mitigation efforts to address performance variances.	**A:** Leadership in applying tracking and trend data to analyze programmatic and technical performance. Leadership in developing, evaluating, and implementing mitigation efforts to address performance variances.	**A:** Directed the application of tracking and trend data to analyze programmatic and technical performance. Directed development, evaluation, and implementation of mitigation efforts to address performance variances.
	B: Knowledge of reserve and margin policies and practices.	**B:** Supported reserve and margin assessment activity	**B:** Applied reserve and margin policy and was involved in resulting decisions	**B:** Tailored reserve and margin policy and managed its application
	C: Knowledge of Program Management Council (PMC)/other reporting requirements when project plan cannot be met.	**C:** Involved with PMC/other reporting when project plan cannot be met.	**C:** Responsibility for PMC/other reporting when project plan cannot be met.	**C:** Responsibility for PMC reporting when project plan cannot be met.

Competency Title	Level I	Level II	Level III	Level IV
6.0 Safety and Mission Assurance				
6.1 Mission Assurance	Knowledge of project activities to support safety and mission assurance including project quality and safety management and the Certificate of Flight Readiness (CoFR) process.	Experience with project activities to support safety and mission assurance such as involvement with flight safety reviews and quality or safety plans. Contributed to the CoFR process.	Leadership role supporting safety and mission assurance through activities such as flight safety reviews, approval, or management of quality or safety plans. Supported a project through the CoFR process.	Managed a project to ensure safety and mission assurance procedures were employed, including flight safety reviews, quality plans, and safety plans. Managed a project through the CoFR process.

Competency Title	Level I	Level II	Level III	Level IV
7.0 NASA and External Environment				
7.1 Agency Structure, Mission, and Internal Goals	Understanding of Center's roles and relationships. Developing key contacts within the Center. Understanding of Center/ Agency vision, mission, plans, and objectives.	Contributed to activities addressing alignment and metrics of assigned functions with Agency vision, mission, plans, and objectives. Participated in an inter-Center or multi-Agency activity.	Participated in actively addressing alignment and metrics of assigned functions with Agency vision, mission, plans, and objectives. Developing key contacts within the Agency. Major participation in an inter-Center or multi-Agency activity. .	Knowledge of NASA's organizational structure, political landscape and other Agency relationships. Leader of inter-Center activity. Demonstration of network of key contacts within the Agency. Leader-ship in actively addressing alignment and metrics of assigned functions with Agency vision, mission, plans, and objectives.
7.2 NASA Project Management Procedures and Guidelines	Knowledge of NPG 7120.5.	Application of NPG 7120.5.	Experience in structuring activity to conform to NPG 7120.5.	Experience in establishing policy directives and criteria for conformation to NPG 7120.5.
7.3 International Standards and Political Implications	Knowledge of International Traffic and Arms Regulations (ITAR) constraints.	Application of ITAR constraints.	Participated in domestic and international partnerships in compliance with ITAR.	Managed the application of international partnerships and ITAR constraints.
7.4 External Relationships	Knowledge of activities involving multiple organizations outside the Center, requiring a network of external contacts including industry partners and utilization of the NASA infrastructure.	Contributed to activities involving multiple organizations outside the Center, developing a network of external contacts including industry partners and utilization of the NASA infrastructure.	Major participation in activities involving multiple organizations outside the Center, enabled by network of external contacts including industry partners and utilization of the NASA infrastructure.	Leadership in development of appropriate domestic and international partnerships and utilization of the NASA infrastructure

Competency Title	Level I	Level II	Level III	Level IV
8.0 Human Capital Management				
8.1 Staffing and Performance	**A:** Understanding NASA's processes for recruiting, evaluating, selecting, and staffing teams.	**A:** Involved in identifying and obtaining the required personnel resources for successful project formulation and implementation.	**A:** Demonstrated capability in identifying and obtaining the required personnel resources for successful project formulation,-implementation, or operations.	**A:** Led establishment of staffing strategies for recruiting, evaluating, selecting and staffing projects.
	B: Basic understanding of techniques for motivating and rewarding professional performance.	**B:** Participated in achieving desired performance through other personnel.	**B:** Demonstrated achievement of desired performance through other personnel. Experience as supervisor desirable but not essential.	**B:** Demonstrated achievement of desired performance through other personnel. Experience as supervisor required.
8.2 Team Dynamics and Management	Understands the importance of teamwork and was a member of a team. Awareness of advocacy and inquiry (openness to changing own viewpoint) to achieve team success. Understands principles of group dynamics.	Led a small team. Involved in team building. Applied advocacy/inquiry (openness to changing own viewpoint) within team. Demonstrated conflict resolution or problem solving within team.	Successfully led a major team, such as a subsystem or small project. Promoted advocacy/inquiry (openness to changing own viewpoint) within team. Demonstrated decisionmaking, conflict resolution, and problem solving within or among teams.	Successfully led a large project team. Accomplished the application of advocacy/inquiry (openness to changing own viewpoint) within team. Demonstrated project decision-making, conflict resolution, and problem solving within or among teams.

Competency Title	Level I	Level II	Level III	Level IV
9.0 Professional and Leadership Development				
9.1 Mentoring and Coaching	Understands the importance of coaching and mentoring.	Coached and mentored subordinates or persons from other groups.	Provided opportunities for development of support personnel. Coached and mentored subordinates or persons from other groups. Received periodic personal coaching from an administrative coach or mentor to improve identified weaknesses.	Created a culture of development for support personnel. Established a coaching and mentoring climate and program for organization. Received periodic personal coaching from an administrative coach or mentor to improve identified weaknesses.
9.2 Communication	Developing skills in speaking, writing, and dialogue in formal and informal communications.	Experience in speaking, writing, and dialogue, both formally and informally. Made presentations of status, challenges, and/or problem solutions.	Demonstrated skills in speaking, writing, and dialogue, both formally and informally. Made presentations to senior management, at professional meetings or at public media events in support of NASA.	Demonstrated skills in speaking, writing, and dialogue, both formally and informally. Communicated and advocated to high levels of Government and pubic media regarding issues of importance to NASA and the public.
9.3 Leadership	Understands the need for leadership improvement and personal development activities.	Examples of leadership improvement and personal and professional development activities.	Demonstrated leadership improvement in personal and professional development activities. Active participation in leadership assessments by team members throughout the project life cycle.	Proactive in leadership improvement and personal development activities. Active participation in leadership assessments by team members throughout the project life cycle.

Competency Title	Level I	Level II	Level III	Level IV
10.0 Knowledge Management				
10.1 Knowledge Capture and Transfer	Understands the value of knowledge capture from all phases of a current project, as well as application of lessons learned/ best practices from previous programs and projects and significant studies, such as the Columbia Accident Investigation Board (CAIB) and Diaz Reports.	Contributed to the documentation of current project history and lessons learned. Evaluated lessons learned/best practices from previous programs and projects and significant studies, such as the CAIB and Diaz Reports.	Integrated the documentation of current project history and lessons learned. Demonstrated capabilities in the use of pertinent lessons learned/best practices from previous programs/ projects and experience, and relevant studies such as the CAIB and Diaz Reports.	Managed the documentation of current project history and lessons learned. Leadership in creating a lessons learned/best practices culture, drawing from previous programs/ projects and significant studies, such as the CAIB and Diaz Reports.

Core Course Descriptions

Foundations of Project Management
Course Code; FPM

Program Overview:
NASA introduces the concepts, processes, and tools of Project Management to new team members in a fast-paced course that gives an overview of the Agency's project development process.

Foundations of Project Management is the Academy of Program/Project Leadership's (APPL's) introductory course for NASA's Level I managers or anyone who works with a project who wants to better understand project management skills and processes. The Foundations course also serves as the first step for any team member with the long-term career goal of becoming a project manager.

The course takes students beyond the technical fields in which they have trained and challenges them to understand how the project team functions as a whole. While working in an active, hands-on format, students learn the techniques, terms, and guidelines that are used to manage cost, schedule, risk, group dynamics, and technical aspects through the life cycle of a project, as described in NPR 7120.5.

Presented as a combination of lecture, group work, and facilitated discussions, the curriculum promotes active learning. Working in small teams, students are challenged by a sequence of project activities as they absorb skills and lessons embedded in the course. As part of APPL's blended learning process, the FPM course introduces students to other Academy initiatives such as ASK Magazine, knowledge sharing workshops, and the continuing role that APPL will play in their professional careers at NASA.

This 4-day course is offered on demand at Centers throughout NASA. Students sign up at their Center training department.

Representative outcomes include learning about:

    Project life cycle phases.
    Individual and team roles.
    WBS.
    Planning and scheduling.
    Reviews and success criteria.
    Risk management.
    Project safety.
    Earned value/performance indicators.
    Configuration management.
    Requirements.
    Prescribing documents.
    Acquisition management.

Project Management
Course Code: PM

Program Overview:
NASA's emerging leaders learn best practices from best-of-the-best practitioners and engage in Project Management simulations and skills assessment in a dynamic learning environment.

This APPL core course is a major milestone in the professional development of NASA project managers. In a 2-week residential class, Level II PMs, team members, and project control staff gain insights into leadership, team development, risk management, scheduling, interteam networking, negotiations, and other critical Project Management competencies that would take years to learn on the job.

Revised to make the student's role more active, this course features a 3-day Project Management simulation, a hands-on learning environment that immerses participants into a highly charged world of managerial decision-making. As course participants plan and implement a simulated project, they must confront and resolve an array of problems associated with vendors, contractors, quality requirements, schedule commitments, and customer interactions while accommodating the personalities and skills of their team.

Other learning techniques include lectures, a computer simulation, videos, process consultation, assessment instruments, group discussions, and reflective activities. Instruction goes beyond tools and techniques. It integrates key management processes, such as building relationships and developing teams, with basic management tasks such as planning schedules, assessing risk, and using Project Management tools. The result is a complete set of leadership skills and behaviors.

In addition, the American Council on Education recommends Project Management for three graduate credits. The course is offered four times a year at Wallops Island, Virginia, and once a year at Ames Research Center in California.

Representative outcomes include learning about:

Recognize when to focus on a task and when to focus on a process for the greater benefit of a project.
Develop defensible project plans.
Use Project Management tools and techniques to effectively track and control projects.
Understand the future of Project Management from the perspective of Agency leaders.
Study and analyze best practices.
Negotiate constructive, long-term agreements.
Understand expectations of project managers from an Agency leadership perspective.
Identify complex tradeoffs in project decisions.

Systems Management
Course Code: SM

Program Overview:
Project Management and systems engineering are traditionally separate disciplines and career paths. Yet they are mutually dependent, and cannot function without one another. In this course, APPL addresses the two as a seamless process.

The need for SM knowledge continues to grow as budget pressures raise the bar of combined technical and business performance. Recognizing NASA's need for management-proficient systems engineers and systems-trained project managers, the APPL offers a 4-day course that bridges Project Management and systems engineering.

SM introduces processes, tools, and language used in managing Agency systems engineering projects, and discusses their application throughout the systems life cycle. The class is designed for engineering, management and other Agency professionals who want to gain knowledge in applying a systems approach to development projects; and, it is appropriate for NASA's Level I and II project managers.

Participants learn how to avoid practices that lead to significant cost and schedule overruns through proper management of the technical aspect of the project cycle. Through a combination of lectures, interactive learning activities, and class discussions, students gain an understanding of how to transform requirements into system architecture through the integration and tradeoff of concepts, effectiveness analysis, and specification development.

The course delivers both theory and application through the use of case studies that provide participants practice in working as a team to solve complex problems and meet business objectives.

APPL offers several SM courses each year at Centers across the Agency.

Representative outcomes include learning about:

    Describing the project system engineering process.
    Directing the project requirements development process.
    Managing system architecture development including concept tradeoffs.
    Directing integration of system components and verifying that requirements have been met.
    Managing system documentation and data configuration management and flow.

Contracting Basics for Contracting Officer's Technical Representatives
Course Code : COTR

Program Overview:

The COTR course is not required by the Agency, but was added by the MSFC PMB as a requirement for certification. It provides instruction in the basic elements and features of a contract, the general process used to develop, award, and administer a contract and the appropriate role of the COTR. Participants learn how to communicate effectively with both the contracting officer and the contractor as well as how to best perform advisory and monitoring responsibilities while serving as a COTR. The newly updated course material includes excerpts from the Federal Acquisition Regulations and any recent changes.

This 3-day course is offered several times each year at MSFC.

Advanced Project Management
Course Code: APM

Program Overview:
The complex, demanding world of projects requires more than tools and techniques. In this intensive, interactive course for APM, NASA's future leaders enhance their management and leadership competencies.

This 2-week residential course represents a major step in the professional development of emerging project managers. It is designed for those individuals who have reached PMDP Level III and who work or aspire to work as systems-level project managers.

Course participants gain an understanding of leadership skills, team development, multiproject thinking, organizational and staff allocation, interteam networking, negotiations, and other competencies required of a successful project manager.

Completely restructured in the fall of 2001 to make the student's role more active, the course features a 3-day simulation in which a highly charged, hands-on learning environment immerses participants in the world of managerial decision-making as they plan and implement a simulated project. Other learning techniques include lectures, a group enterprise project, videos, process consultation, assessment instruments, group discussions, and a balance of action and reflection.

Participants, mentored by top project managers from NASA and private industry, confront and resolve an array of problems associated with tasks, vendors, contractors, quality requirements, schedule commitments, and customer interactions.

APM looks beyond the horizon of single projects to the multiple demands of concurrent projects competing for project priority, visibility, and business resources. The result is a complete set of leadership skills and behaviors that ordinarily would take months, even years, to acquire.

In addition, the American Council on Education recommends APM for four graduate credits.

Representative outcomes include learning about the following:

    Tools of project life cycle management.
    Tailoring policy requirements to the project.
    Project teamwork.
    Personnel leadership, coaching, and mentoring skills.
    Project risk management.
    Personnel development.
    Project performance measurement and assessment.
    Rapid prototyping.
    NASA strategic plans and future directions.

Program Management
Course Code: PGM

Program Overview:
The goal of the Program Management program is to provide a view from those inside and outside of NASA, while serving as a forum for PGMs and project people to share knowledge, experiences, and creative approaches to Program Management. Participants will discuss:

Best/emerging practices.
Useful tools and techniques.
Lessons learned.
New skills and concepts.
Program and Project Management career development.
Networking between public/private sector and across Centers.

Program Objective:
The objective of this program is that, upon completion, NASA personnel will possess a stronger understanding of issues relating to Program and Project Management including:

Organizational relationships.
Congressional-level budgeting concerns.
Leadership.
Strategic planning and goal establishment.
Advocacy.
Relationship with Capitol Hill.
Executing the budget.
External environment.
Working with the Office of Management & Budget.

Major Topics:
Visionary Program Management.
Strategic program development.
Top-level communications.
Strategic issues and international perspective.
Organizational development and staffing.
NASA budget process.
Strategic planning.
Business management.
Coaching and mentoring.
Congress and NASA today.

International Project Management
Course Code: IPM

Program Overview:
In the IPM course, project practitioners gain an understanding of cultural challenges, legal concerns, and teaming issues that they are likely to encounter while working with international partners.

The APPL offers an IPM course for Level II through Level IV managers who work on international projects. The course addresses two distinct facets of successful IPM: 1) Technical knowledge and 2) cultural understanding. In one component, course participants gain explicit, technical knowledge required to be effective in the international arena. This section of the class covers international laws, export controls, security requirements, and international business structures.

The cultural understanding that goes into managing or participating in an international project team, at any level, is just as important. This area covers advocacy, partnering, and much of the "softer" side of cross-cultural relations (e.g., initiating the personal relationship that in many cultures is a prerequisite to establishing a professional relationship).

Course materials and discussion provide insights into the characteristics of international teaming that have the potential to make or break a project. The course format features lectures, small group discussion, hands-on practical exercises, and case studies.

Instructors are successful NASA project managers from the international arena, who discuss their experiences with participants—shedding light on multinational project traps and how to avoid them. Guest lecturers include senior embassy personnel and other outside experts.

This 5-day course is offered two or three times a year in the Washington, D.C., area. The recommended prerequisite is APPL's Project Management course.

IPM offers managers a working knowledge in the following areas:

Partners and structures.
Export control regulations.
Building cross-cultural relationships.
International negotiations.
Project implementation.
Country-specific outlooks.
Legal and ethical issues.

<h1 style="text-align:center">Sample Responses</h1>

Sample Candidate Responses and Evaluations for a Level II Competency

Level II Competency	Candidate Response	Evaluation
2.1 Risk Management Participated in a risk management process and utilization of risk analysis to support decisionmaking.	Gained knowledge of risk management strategies while supporting project activities, 2002–2003.	**Acceptable** Candidate has not provided specifics to support attainment and demonstration of the skill. Note that the response reports "Gained knowledge;" for obtainment of Level II, candidates should have been involved and applied these skills.

Level II Competency	Candidate Response	Evaluation
2.1 Risk Management Participated in a risk management process and utilization of risk analysis to support decisionmaking.	Attended MSFC Risk Management Course, 2002.	**Weak Response** Candidate has acquired the skill, but has not demonstrated it on the job. This is a weak response and will only be accepted for a limited number of requirements. As the candidate strives for higher certification levels emphasis on practical work experience will increase.

Level II Competency	Candidate Response	Evaluation
2.1 Risk Management Participated in a risk management process and utilization of risk analysis to support decisionmaking.	Attended MSFC Risk Management Course, 2002. Applied ePort to support identification, evaluation and management of all project risks (including technical, cost and schedule) for Gravity Probe B, 2002–2003. Participated in briefings to project management and staff on the status of critical risk items for Gravity Probe B, 2003.	**Strong Response** Includes both training and application of the skill. Note identification of tool, project, and dates of the activities.

Sample Candidate Responses and Evaluations for a Level III Competency

Level III Competency	Candidate Response	Evaluation
5.2 Tracking/Trending of Project Performance Leadership role in project reporting and evaluation of programmatic and technical performance metrics. Utilized performance metrics, earned value and risk management analysis. Conducted continual project monitoring and formal reviews.	Served as a review team member on various design reviews. Participated as the thermal lead for a project Technical Interchange Meeting (TIM) that resulted in the resolution of a major cost and schedule issue.	**Not Acceptable** Candidate has not provided specifics to support leadership or management of this activity. Note that the response uses the term "served" and "participated;" for obtainment of Level III, candidates should demonstrate leadership, and management responsibility in these skills.

Level III Competency	Candidate Response	Evaluation
5.2 Tracking/Trending of Project Performance Leadership role in project reporting and evaluation of programmatic and technical performance metrics. Utilized performance metrics, earned value and risk management analysis. Conducted continual project monitoring and formal reviews.	Led a "tabletop" Critical Design Review for the OPGCA (protein crystal growth experiment) that flew on STS–88 in 1997,	**Weak Response** Candidate has acquired the skill, but has only demonstrated it on a small project, using a tailored review process. This is a weak response and will only be accepted for a limited number of requirements at this level.

Level III Competency	Candidate Response	Evaluation
5.2 Tracking/Trending of Project Performance Leadership role in project reporting and evaluation of programmatic and technical performance metrics. Utilized performance metrics, earned value and risk management analysis. Conducted continual project monitoring and formal reviews.	As the Environmental Control and Life Support Systems Chief Engineer, I led a Project Requirements Review (1998) and Preliminary Design Review (1999). Defined and quantified Review Item Dispositions (RID) issues and made presentations to the preboard and board. Signed RID closures along with the board chairman. As a senior systems engineer in the Systems management Office (SMO), I lead a red team review of the X–38 project (2001). Participated as the systems lead for an NAR (2000) and Independent Annual Review (2002) conducted by the Independent Program Assessment Office of the Ultra Efficient Engine Technology Program at the Glenn Research Center. Utilized Technical Performance Metrics, Earned Value Management data, and risk mitigation actions to gain insight, evaluate, and report on project programmatic and technical performance.	**Strong Response** The candidate has demonstrated accountability and responsibility for multiple reviews. Specific dates and projects are listed, and the candidate's role in each review is included. Note that the candidate has shown an accomplishment in a rotational assignment, in this case, in the SMO.

Glossary

Acquisition: The acquiring, by contract, of supplies or services (including construction) through purchase or lease, whether the supplies or services are already in existence or must be created, developed, demonstrated, or evaluated. Acquisition begins at the point when Agency needs are established and includes the description of requirements to satisfy Agency needs, solicitation, and selection of sources, award of contracts, contract financing, performance, administration, technical, and management functions directly related to the process of fulfilling Agency needs by contract.

Baseline: The technical performance and content, technology application, schedule milestones, and budget that are documented in the approved Program and Project Plans.

Configuration Management: A management discipline applied over the product's life cycle to provide visibility and to control performance and functional and physical characteristics.

Contract: A mutually binding legal relationship obligating the seller to furnish the supplies or services (including construction) and the buyer to pay for them. In addition to bilateral instruments, contracts include, but are not limited to, awards and notices of awards; job orders or task letters initiated under basic ordering agreements; letter contracts; orders, such as purchase orders, under which the contract becomes effective by written acceptance or performance; and bilateral contract modifications.

Earned Value Management: Earned Value Management (EVM) is a tool for measuring and assessing program/project performance through the integration of technical, cost, and schedule parameters during the execution of the program or project.

Formulation: The subprocess used to define the program/project concept and plan to meet customer requirements.

Functional Architecture: The arrangement of functions, their decomposition, and interfaces (internal and external) that defines the execution sequencing, conditions for control or data flow, and the relative performance levels of achievement for a desired outcome, or that provides a desired capability.

Implementation: The subprocess used to deliver the products and capabilities specified in the approved Program/Project Plan.

Infrastructure: The human resources, facilities, equipment, information resources, and administrative and program support services available to support programs and projects. Utilization of the capability afforded by the infrastructure includes consideration of the maintenance and other liabilities it presents.

Lesson Learned: The significant knowledge or understanding gained through past or current programs and projects that is documented and collected to benefit current and future programs and projects.

Life Cycle Cost: The total of the direct, indirect, recurring, nonrecurring, and other related expenses incurred, or estimated to be incurred, in the design, development, verification, production, operation, maintenance, support, and retirement of a system over its planned life.

Margin: The allowances carried in budget, projected schedules, and technical performance parameters (e.g., weight, power, or memory) to account for uncertainties and risks. Margins are baselined in the formulation subprocess, based on assessments of risks, and are consumed as the program/project proceeds through the life cycle.

Metric: A measurement taken over a period of time that communicates vital information about a process or activity. A metric should drive appropriate action.

Mission Assurance: Those independent activities performed outside of the program or project that are necessary to provide increased confidence in achieving mission success. The mission assurance activities will typically include independent assessments, non-Advocate Reviews (NARs), process verification, program or project reviews and audits, quality assurance, software verification, and other activities that validate approaches and/or highlight potential problem areas.

Mission Success: Those activities performed in line and under the control of the program or project that are necessary to provide assurance that the program or project will achieve its objectives. The mission success activities will typically include risk assessments, system safety engineering, reliability analysis, quality assurance, electronic and mechanical parts control, software validation, failure reporting/resolution, and other activities that are normally part of a program or project work structure.

Mission: A major activity required to accomplish an Agency goal or to effectively pursue a scientific, technological, or engineering opportunity directly related to an Agency goal. Mission needs are independent of any particular system or technological solution.

Operational Architecture: Complete description of the system design, including the functional architecture allocated to the physical architecture, derived input/output, technology and system-wide, tradeoff, and qualification requirements for each component, an interface architecture that has been integrated as one of the components, and complete documentation of the design and major design decisions.

Physical Architecture: The hierarchical arrangement of product and process solutions, their functional and performance requirements, their internal and external functional and physical interfaces and requirements, and the physical constraints that form the basis of design requirements.

Program (Project) Team. All participants in program (project) formulation and implementation; this includes all direct reports and others that support meeting program (project) responsibilities.

Program Management Council: One of the hierarchies of forums, composed of senior management that assesses program and project planning and implementation and provides oversight and direction as appropriate. These are established at the Agency, Enterprise, Center, and lower levels.

Program Operating Plan: A document produced by a Center in response to HQ-directed budget guidelines, including requested budgets by program or project.

Program. A program is major activity within an Enterprise having defined goals, objectives, requirements, and funding levels, and consisting of one or more projects.

Project Management Board: This board, which is cochaired by the Director of Customer and Employee Relations (CaER) and the Manager of the SMO and consists of a number of deputy direct reports to the MSFC Center Director, evaluates candidates for certification award.

Project: An activity, designated by a program, characterized as having defined goals, objectives, requirements, a life cycle cost, a beginning, and an end:

Quality Assurance: A planned and systematic set of actions necessary to provide confidence that the products or services conform to documented requirements.

Reserves: The fiscal resources available for approved changes in program objectives or scope that are documented in the Program Commitment Agreement, the resolution of unforeseen major problems, program/project stretch outs from Agency funding shortfalls and similar fiscal events; and, the contingency resources including funding, schedule, performance, manpower, and services, allocated to and managed by the Program/Project Manager for the resolution of problems normally encountered to mitigate risks while ensuring compliance to the specified program/project scope.

Risk Management: An organized, systematic decision making process that efficiently identifies, analyzes, plans, tracks, controls, communicates, and documents risk to increase the likelihood of achieving program/project goals.

Risk: The combination of the following: 1) The probability (qualitative or quantitative) that a program or project will experience an undesired event such as cost overrun, schedule slippage, safety mishap, compromise of security, or failure to achieve a needed technological break-through; and 2) the consequences, impact, or severity of the undesired event were it to occur.

Safety: Freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

Stakeholder: A stakeholder is an individual or organization having an interest (or stake) in the outcome or deliverable of a program or project.

Success Criteria: That portion of the top-level requirements that define what will be achieved to successfully satisfy the Strategic Plan objectives addressed by the program, project, or technology demonstration.

System: The combination of elements that function together to produce the capability required to meet a need. The elements include all hardware, software, equipment, facilities, personnel, processes, and procedures needed for this purpose.

Systems Engineering: The process that involves the application of scientific and engineering efforts to accomplish the following: 1) Transform an operational need into a description of system performance parameters and a preferred system configuration through the use of an iterative process of functional analysis, synthesis, optimization, definition, design, test, and evaluation; 2) incorporate related technical parameters and ensure compatibility of all physical, functional, and program interfaces in a manner that optimizes the total system definition and design; and 3) integrate the efforts of all engineering disciplines and specialties into the total engineering effort.

Technical Insight/Penetration: The level of government involvement in contracted programs to mitigate program risk.

Technical Integration: The interactive activity among all participants in the design process, whereby the compartmentalized parts—subsystems (hardware and software), design functions, and discipline functions—are designed and reintegrated into a balanced, successful total design. Technical integration is enabled by formal and informal information flow, by a system focus of all participants on how their part affects the total system, and by leadership that continually ensures that interactive aspects of the design are being addressed and balanced.

Verification. This is proof of compliance with specifications. May be determined by a combination of test, analysis, demonstration, and inspection.

Work Breakdown Structure: A product-oriented hierarchical division of the hardware, software, services, and data required to produce the program's/project's end product(s), structured according to the way the work will be performed, and reflective of the way in which program/project costs, schedule, technical, and risk data are to be accumulated, summarized, and reported.

Acronyms

APM	Advanced Project Management
APPL	Academy of Program/Project Leadership
CaER	Customer and Employee Relations
CAIB	Columbia Accident Investigation Board
CoFR	Certificate of Flight Readiness
COTR	Contracting Officer's Technical Representative
DRD	Data Requirement Description
EODD	Employee and Organization Development Department
EVM	Earned Value Management
FPM	Foundations of Project management
HQ	Headquarters
IDP	Individual Development Plans
IPM	International Project Management
ITAR	International Traffic and Arms Regulations
MSFC	Marshall Space Flight Center
NAR	non-Advocate Reviews
NASA	National Aeronautics and Space Administration
PGM	Program Manager
PM	Project Manager
PMB	Project Management Board
PMC	Program Management Council
PMDP	Project Management Development Process
POP	Program/Project Operating Plan
PPA	programs, projects, and activities
PRR	Program Requirement Reviews
RID	Review Item Dispositions
SM	Systems Management
SMO	Systems Management Office
SOW	Statements of Work
WBS	Work Breakdown Structure

Applicable Documents

The following documents are applicable to the PMDP process. NPR 7120.5 contains reference to the NASA Policy Directives and the NASA Procedures and Guidelines that govern the various Program/Project Management tasks.

NASA Documents

| Number	Title
NPR 7120.5	NASA Program and Project Management Processes and Requirements
SP–6105	NASA Systems Engineering Handbook

Reference Documents

The following reference documents provide MSFC Procedures and Guidelines and Work Instructions that govern the various Program/Project Management tasks specifically at MSFC.

MSFC Documents

Number	Title
MPG 7100.1	Proposal Development Process
MPG 7120.1	Program/Project Planning
MPG 7120.4	MSFC Project Management Council Process
MPG 8060.1	Flight Systems Design/Development Control
MWI 8050.1	Verification of Hardware, Software, and Ground Support Equipment for MSFC Projects
MWI 8060.3	Requirements and Design Reviews, MSFC Programs/Projects
MSFC–HDBK–3173	Program Management/Systems Engineering Handbook
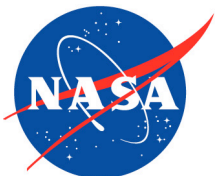
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NP-2004-06-79-MSFC
Pub 8-40271